



## WOOD FLOOR TRUSSES

Over the past several weeks, a number of e-mails from MCFRS personnel have identified a new truss flooring system that does not require gusset plates. The original e-mail surfaced from an individual who witnessed the use of this new system in New Jersey. The writer goes on to say:

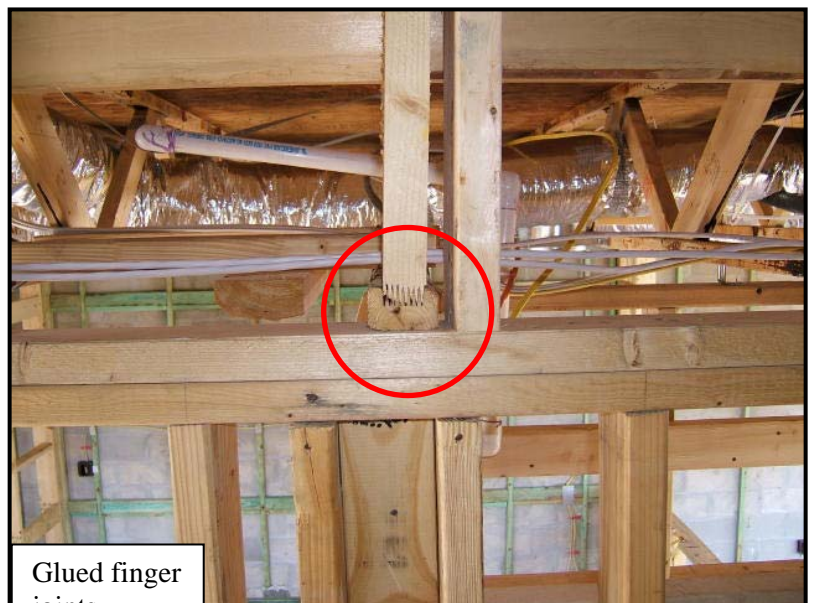
*“ Apparently these new style wood trusses are commercially available and no longer use the metal “gusset plates” that we are familiar with. This new breed of firefighter killers is simply 2x4 finger-jointed lumber held together by little spots of glue where the webs meet the chords. If a standard gusset plated truss will fail in less than five minutes of fire exposure, how long will these toothpicks stand up? How about the added weight of 2 or 3 firefighters trying to make a vent hole*

*and removing some of the engineered deadload providing the stability to the system? This stuff's out there.....just a matter of time 'til it pops up around here."*

While following up on the subject matter, a couple of developments regarding this parallel chord floor truss system have been discovered. ***Open Joist 2000*** is the trade name for this new pre-fabricated floor joist system. The company, Toiture Mauricenne, is based in Canada with US distributors in Connecticut, Maine, Massachusetts, Michigan, New Hampshire, and Pennsylvania (our neighbors). The system is a patented design whose selling point promises to reduce floor squeaking, better absorb floor vibrations, and eliminate the need for dropped ceilings because of the open web design (HVAC duct work can pass thru). The system utilizes dimensional lumber with notched and glued finger joints absent of any other nails or other connectors. The glue is Phenol Resorcinol which, according to the manufacturer, is water resistant and flame retardant (highly debatable). After contacting one of the distribution/manufacturing plants, it was discovered that ***Open Joist 2000*** has been subjected to the ASTM E119 standard fire resistance test required by UL (inconclusive due to the unrealistic, pristine test structure), is approved under the IBC (International Building Code consensus standard followed in the state of MD) and that the company is currently seeking a Maryland State stamp of approval to distribute and sell.....here in our area!



HVAC Duct Work passing thru



Glued finger joints



Let's review some basic facts concerning trusses. According to Francis Brannigan's **Building Construction for the Fire Service**, a truss is a framed unit consisting of a triangle or group of triangles arranged in a single plane in such a manner that loads applied at the points of intersections of the members will cause only direct stresses in the members; loads applied between these points cause flexural stresses. The top and bottom members of the truss are called **chords**. The compressive connecting members are called **struts**. The tensile connecting members are called **ties**. Connections are called **panel points**. As a group, the ties, strut, and panel points are collectively called the **web**. It is lighter in weight than solid construction, provides long spans allowing maximum flexibility in the use of space, and arrives to the construction site pre-fabricated.



The top chord of a truss is in compression while the bottom chord is in tension. Damaged or decreased material in the bottom or top chords will increase the tensile forces affecting stability. The engineering advantage of the truss system is that it provides separation of compression and tensile stresses while utilizing a minimum of material. Every part of a truss, from the chord to its connectors, is interdependent and relies upon such for its strength.

Some of the common problems associated with the wooden floor truss joist as it relates to firefighter safety are:

1. Missing or damaged members. All parts of a truss are vital to its stability.
2. Cross-bridging and “strong backs” are used to tie in and distribute the weight of a load among a number of joists. When a single truss fails, undersigned loads are transferred possibly causing the failure of multiple joists.

3. Failing connectors. Gusset plates, when heated, can damage wood fibers holding the teeth in place. Glue used in the notched finger joints, when heated, may loose its connectivity. Both instances may jeopardize the integrity of the system.



Floor Trusses with Gusset Plates

4. Open web design allows for the lateral migration of smoke, carbon monoxide, and fire which would be unbeknownst to the entering firefighter.
5. Delaminating of engineered wood members when exposed to instances of heat in addition to contributing flammable gas production.
6. Failure due to undersigned loads.



TJI Wooden Joist.....all engineered lumber with OSB laminated webbing. Supported by joist hangers or “saddle straps”



There is no way of knowing what type of flooring system looms under our feet when we enter these structures to fight fires. Certainly when engaged in an offensive interior attack in a structure comprised of lightweight construction, we must maintain situational awareness for signs of early failure due to prolonged fire exposure and fire loading. As new structures are built in our response areas, it is important that we get out and study the construction methods and materials. This effort will help identify potential problems in determining safe tactical decision making prior to our arrival at an emergency.



I would like to thank the members of MCFRS who brought this topic to the forefront.

**KEEP IT SAFE!**



**“DEDICATION TO EDUCATION”**

